CLAIMS

1. Method for forming a chopper-type direct-current converter comprising:

a magnetic core (M), which comprises:

a first and a second side legs (MS1, MS2), the ends of the which are connected to each other with end pieces (MP1, MP2); and

a center-leg (MK) provided with an air gap (G) and connected to the end pieces (MP1, MP2) between the first and the second side legs (MS1, MS2); around which magnetic core (M) are arranged:

a primary winding (P; P1, P2, P3, P4);

a secondary winding (S; S1, S2); and

a secondary-side filter coil (Sc), characterized in that

the filter coil (Sc) is disposed around the center leg (MK); and

the primary and secondary windings (P, S) are disposed around the side legs (MS1, MS2) so that the magnetic flux produced by the windings flows in the same direction with the magnetic flux of the filter coil (Sc).

2. Method as defined in claim 1, characterized in that four windings (P1, P2, P3, P4) are provided on the primary side of the converter, two (P1, P2; P3, P4) of the windings being connected in series around the first and the second side legs (MS1, MS2) so that the magnetic flux produced by the windings flows in the same direction on each side leg.

3. Method as defined in claim 1 or 2, characterized in that two windings (S1, S2) are provided on the secondary side of the converter, connected around the first and the second side legs (MS1, MS2) so that the direction of the magnetic flux produced by the windings is opposite to the magnetic flux of the primary winding placed on the same side leg.

4. Method as defined in any one of claims 1 - 3, characterized in that

the primary windings (P) are controlled by means of a first and a second switching element (A, B); and

two capacitors are provided on the primary side so that the first capacitor (C1) is connected in series between the switching elements (A, B) and the second capacitor (Ci) is connected in parallel with the supply voltage (Ui).

5. Method as defined in claim 2, characterized in that two switching elements (A, B) and two capacitors (C1, C2) are provided on the primary side of the converter in such manner that:

the first switching element (A) is connected in series between two primary windings (P1, P2) and the second switching element (B) correspondingly in series between the other two primary windings (P3, P4); and

the first capacitor (C1) is connected from the first side of the first switching element (A) to the second side of the second switching element (B) and the second capacitor (C2) is connected from the second side of the first switching element (A) to the first side of the second switching element (B).

6. Method as defined in claim 1, characterized in that four windings (P1, P2, P3, P4) are provided on the primary side of the converter by connecting two windings (P1, P2) in series around the first and the second side legs (MS1, MS2) so that the magnetic flux produced by the windings will flow in the same direction in both side legs and by connecting the other two windings (P3, P4) so that the direction of the magnetic flux produced by them is opposite to the flux of the former winding on the same side leg.

7. Method as defined in claim 6, characterized in that two switching elements (A, B) and a capacitor (Ci) are provided on the primary side in such manner that:

the first switching element (A) is connected by one end in series with two primary windings (P1, P2) and by the other end to the second pole of the input voltage (Ui);

the second switching element (B) is connected correspondingly with the other two primary windings (P3, P4); and

the capacitor (Ci) is connected in parallel with the input voltage (Ui).

8. Method as defined in claim 1, characterized in that two switching elements (A, B), two capacitors (C1, C2) and two windings (P1, P2) are provided on the primary side in such manner that:

a half-bridge circuit consisting of the switching elements (A, B) and capacitors (C1, C2) is formed; and

the windings (P1, P2) are connected in series so that the magnetic flux produced by the windings flows in the same direction on each side leg (MS1, MS2) and the windings are connected by one end between the switching elements (A, B) and by the other end between the capacitors (C1, C2).

9. Method as defined in claim 1, characterized in that four switching elements (A, B, C, D), a capacitor (Ci) and two windings (P1, P2) are provided on the primary side in such manner that:

a full bridge is formed from the switching elements (A, B, C, D);

the capacitor (Ci) is connected in parallel with the input voltage (Ui); and

the windings (P1, P2) are connected in series so that the magnetic flux produced by them flows in the same direction on both side legs and the windings are connected by one end between two switching elements (A, B) and by the other end between the other two switching elements (C, D).

10. Method as defined in any one of claims 1 - 9, characterized in that the first end of

the filter coil (Sc) winding is connected between the secondary windings (MS1, MS2) on the first and the second side legs (MS1, MS2) and the other end is connected to the first pole of the output voltage (Uo) of the converter.

11. Method as defined in any one of claims 1 - 10, characterized in that a third and a fourth switching element (A', B') are provided on the secondary side, connected in series with the secondary winding, and the second pole of the output voltage (Uo) of the converter is disposed between the third and the fourth switches (A', B').

12. Method as defined in claim 10, characterized in that a first and a second diode (D1, D2) are provided on the secondary side, connected in series with the secondary winding (S1, S2), and the second pole of the output voltage (Uo) of the converter is disposed between the first and second diodes (D1, D2).

13. Method as defined in any one of claims 1 - 12, characterized in that at least two different voltage outputs (Uo1, Uo2) are provided on the secondary side in such manner that, for each voltage output, two windings are provided around the first and the second side legs.

14. Method for forming a chopper-type regulator comprising:

a magnetic core (M), which comprises:

a first and a second side leg (MS1, MS2), the ends of which are connected to each other with end pieces (MP1, MP2); and

a center leg (MK) provided with an air gap (G) and connected to the end pieces (MP1, MP2) between the first and second side legs (MS1, MS2); around which magnetic core (M) are arranged:

two windings (S1, S2); and

a filter coil (Sc), characterized in that

the filter coil (Sc) is disposed around the center leg (MK); and

the windings (S1, S2) are so arranged around the side legs (MS1, MS2) that the magnetic flux produced by them flows in the same direction as the magnetic flux of the filter coil (Sc).

15. Chopper-type direct-current converter comprising:

a magnetic core (M), which comprises:

a first and a second side leg (MS1, MS2), the ends of which are connected to each other with end pieces (MP1, MP2); and

a center leg (MK) provided with an air gap (G) and connected to the end pieces (MP1, MP2) between the first and second side legs (MS1, MS2); around which magnetic core (M) are arranged:

a primary winding (P; P1, P2, P3, P4);

a secondary winding (S; S1, S2); and

a secondary side filter coil (Sc), characterized in that

the filter coil (Sc) is wound around the center leg (MK); and

the primary and secondary windings (P, S) are wound around the side legs (P; P1, P2, P3, P4) so that the magnetic flux produced by them flows in the same direction as the magnetic flux of the filter coil (Sc).

16. Converter as defined in claim 15, characterized in that the primary side of the converter is provided with four windings (P1, P2, P3, P4), two windings (P1, P2; P3, P4) being connected in series around the first and the second side legs (MS1, MS2) so that the magnetic flux produced by the windings flows in the same direction on both side legs.

17. Converter as defined in claim 15 or 16, characterized in that the secondary side of the converter is provided with two windings (S1, S2) connected in series around the first and the second side legs (MS1, MS2) so that the magnetic flux produced by the windings flows in a direction opposite to the direction of the magnetic flux produced by the primary winding placed on the same side leg.

18. Converter as defined in any one of claims 15 - 17, characterized in that:

the primary side is provided with series-connected first and second switching elements (A, B), which are connected in parallel with the input voltage (Ui) and which serve to control the primary windings (P); and

the primary side is provided with two capacitors (C1, Ci), the first capacitor (C1) being connected between the switching elements (A, B) and the second capacitor (Ci) in parallel with the input voltage (Ui).

19. Converter as defined in claim 16, characterized in that the primary side of the converter is provided with two switching elements (A, B) and two capacitors (C1, C2) in such manner that:

the first switching element (A) is connected in series between two primary windings (P1, P2) and the second switching element (B) correspondingly in series between the other two primary windings (P3, P4); and

the first capacitor (C1) is connected to the first side of the first switching element (A) and to the second side of the second switching element (B) and the second capacitor (C2) is connected to the second side of the first switching element (A) and to the first side of the second switching element (B).

20. Converter as defined in claim 15, characterized in that the primary side of the converter is provided with four windings (P1, P2, P3, P4) in such manner that:

two windings (P1, P2) are connected in series around the first and second side legs (MS1, MS2);

the magnetic flux produced by windings (P1, P2) flows in the same direction on both side legs (MS1, MS2); and

the other two windings (P3, P4) are connected in a corresponding manner so that the windings produce a magnetic flux in a direction opposite to the former windings on the same side leg.

21. Converter as defined in claim 20, characterized in that the primary side is provided with two switching elements (A, B) and a capacitor (Ci) in such manner that:

the first and second switching elements (A, B) are connected by one end in series with two primary windings (P1, P2) and by the other end to one pole of the input voltage (Ui); and

the capacitor (Ci) is connected in parallel with the input voltage (Ui).

22. Converter as defined in claim 15, characterized in that the primary side is provided with two switching elements (A, B), two capacitors (C1, C2) and two windings (P1, P2) in such manner that:

the switching elements (A, B) and the capacitors (C1, C2) are arranged in a half-bridge circuit; and

the windings (P1, P2) are connected in series so that the magnetic flux produced by the windings flows in the same direction on both side legs (MS1, MS2) and the windings are connected by one end between the switching elements (A, B) and by the other end between the capacitors (C1, C2).

23. Converter as defined in claim 15, characterized in that the primary side is provided with four switching elements (A, B, C, D), a capacitor (Ci) and two windings (P1, P2) in such manner that:

the switching elements (A, B, C, D) are arranged in a full bridge circuit;

the capacitor (Ci) is connected in parallel with the supply voltage (Ui); and

the windings (P1, P2) are connected in series so that the magnetic flux produced by the windings flows in the same direction on both side legs (MS1, MS2) and the windings are connected by one end between two switching elements (A, B) and by the other end between the other two switching elements (C, D).

24. Converter as defined in any one of claims 15 - 23, characterized in that the first end of the filter coil (Sc) is connected between the secondary windings on the first and second side legs (MS1, MS2) and the second end is connected to the first pole of the output voltage (Uo) of the converter.

25. Converter as defined in any one of claims 15 - 24, characterized in that the secondary side is provided with a third and a fourth switching element (A', B') connected in series with the secondary winding and the second pole of the output voltage (Uo) of the converter is disposed between the third and fourth switching elements (A', B').

26. Converter as defined in claim 24, characterized in that the secondary side is provided with a first and a second diode (D1, D2) connected in series with the secondary winding (S1, S2) and the second pole of the output voltage (Uo) of the converter is disposed between the first and second diodes (D1, D2).

27. Converter as defined in any one of claims 15 - 26, characterized in that the secondary side is provided with at least two different voltage outputs (Uo1, Uo2) in such manner that, for each voltage output, two windings are connected around the first and second side legs.

28. Chopper-type regulator, comprising:

a magnetic core (M), which comprises:

a first and a second side leg (MS1, MS2), the ends of which are connected to each other with end pieces (MP1, MP2); and

a center leg (MK) provided with an air gap (G) and connected to the end pieces (MP1, MP2) between the first and second side legs (MS1, MS2); around which magnetic core (M) are arranged:

two windings (S1, S2); and

a filter coil (Sc), characterized in that

the filter coil (Sc) is disposed around the center leg (MK); and

the windings (S1, S2) are disposed around the side legs (MS1, MS2) so that the magnetic flux produced by them flows in the same direction with the magnetic flux of the filter coil (Sc).